



UAV TCS Route & Payload Planner

16/17 December 1997



Design Review Topics

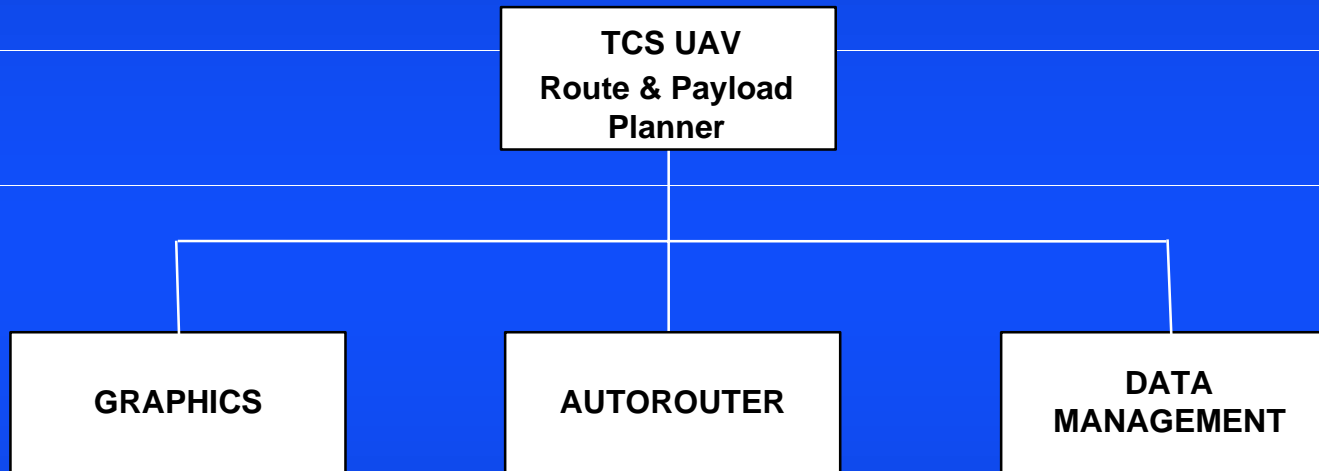
- **Top Level CSC Design**
- **TCS Data Server & JMTK Chart Integration**
- **Software Functionality**



Top Level CSC Design

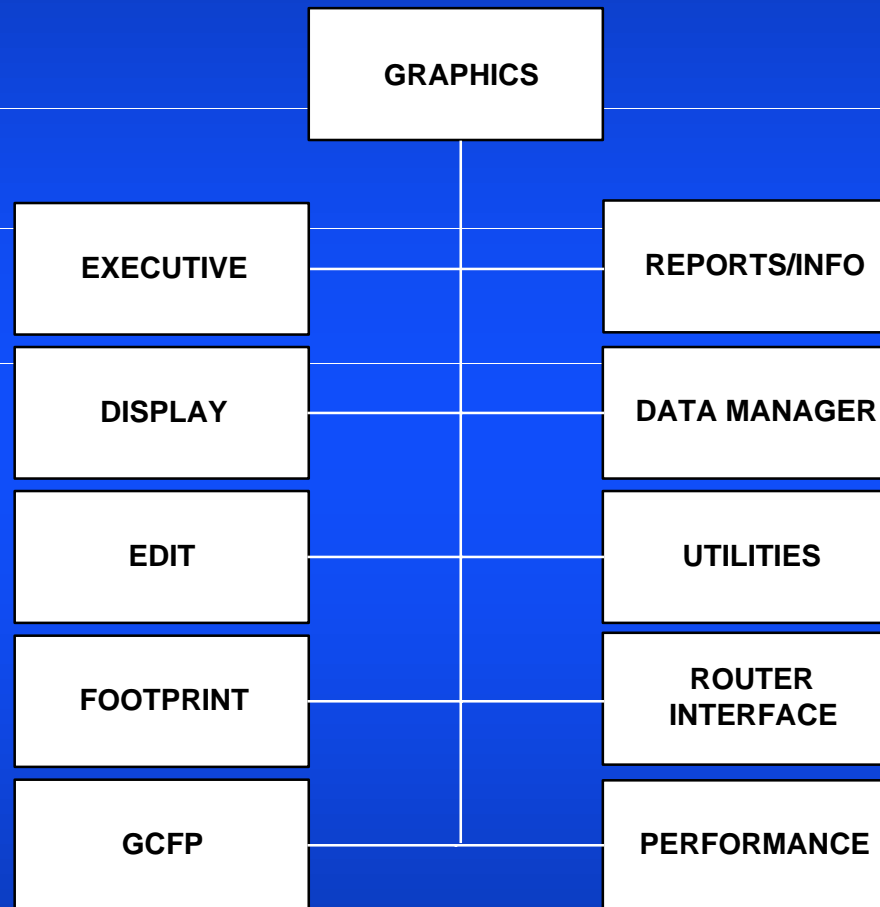


S/W Architecture – TLCSCs



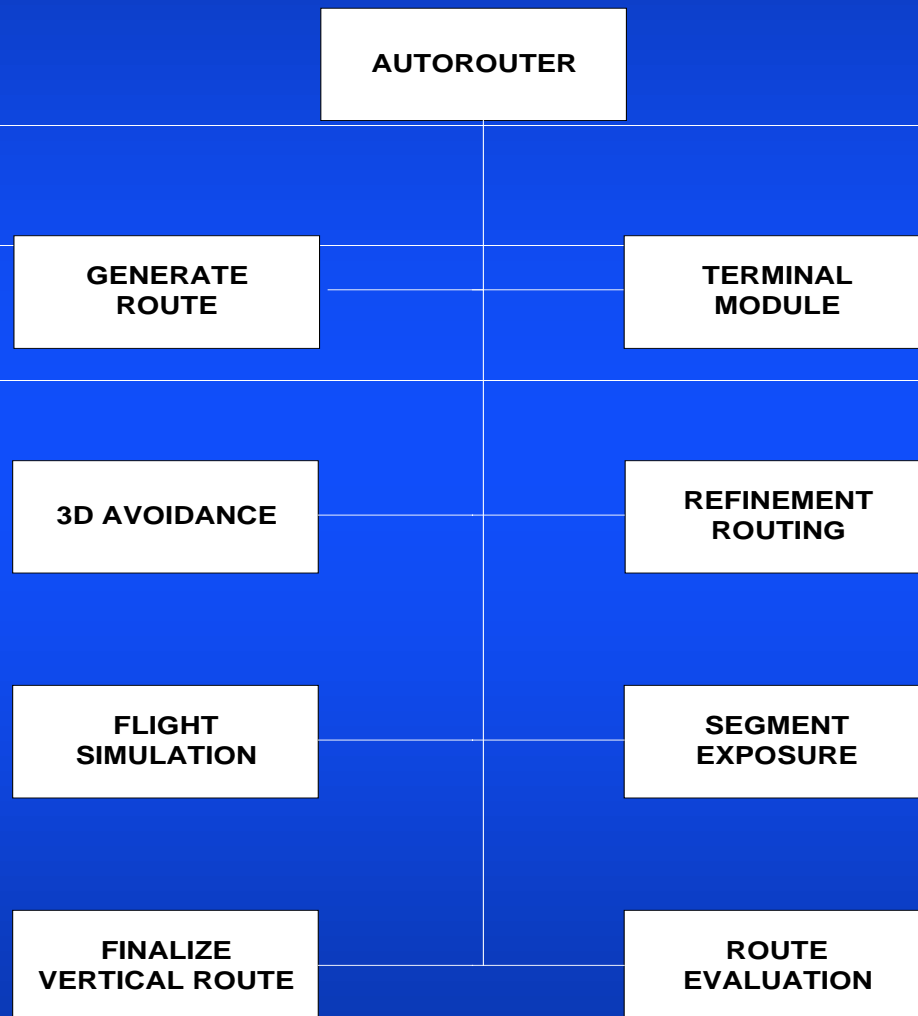


S/W Architecture – Graphics



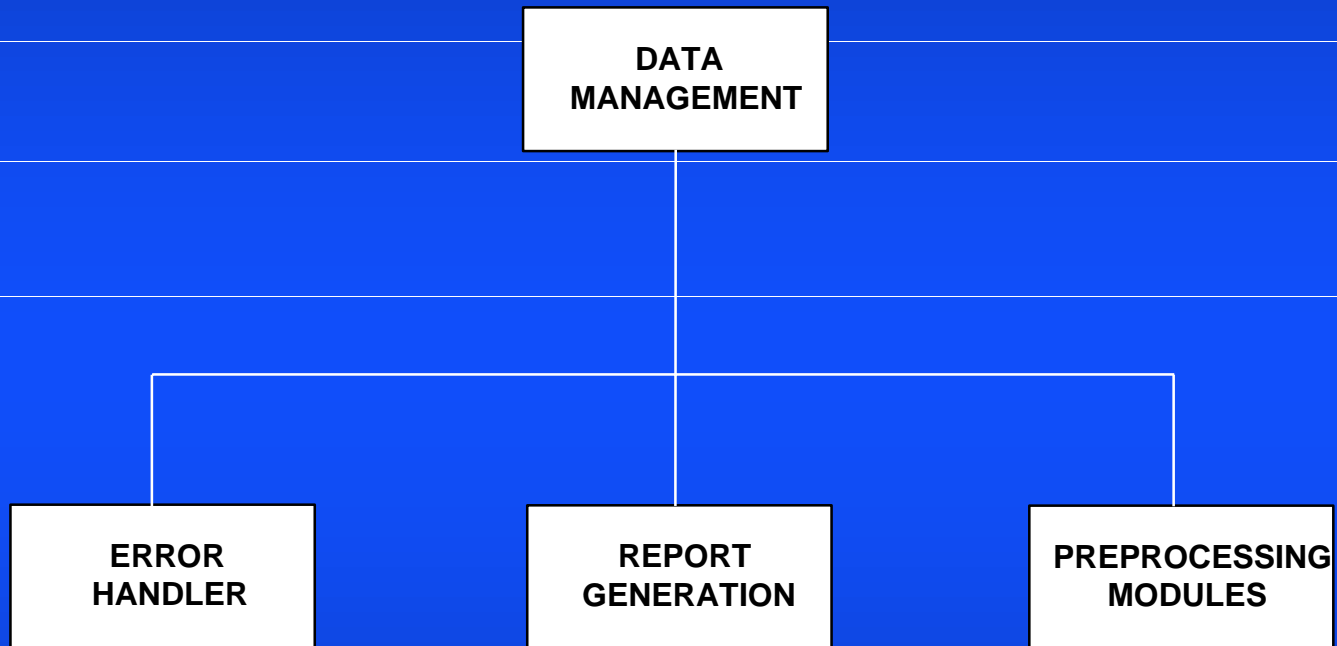


S/W Architecture – Autorouter





S/W Architecture – DM



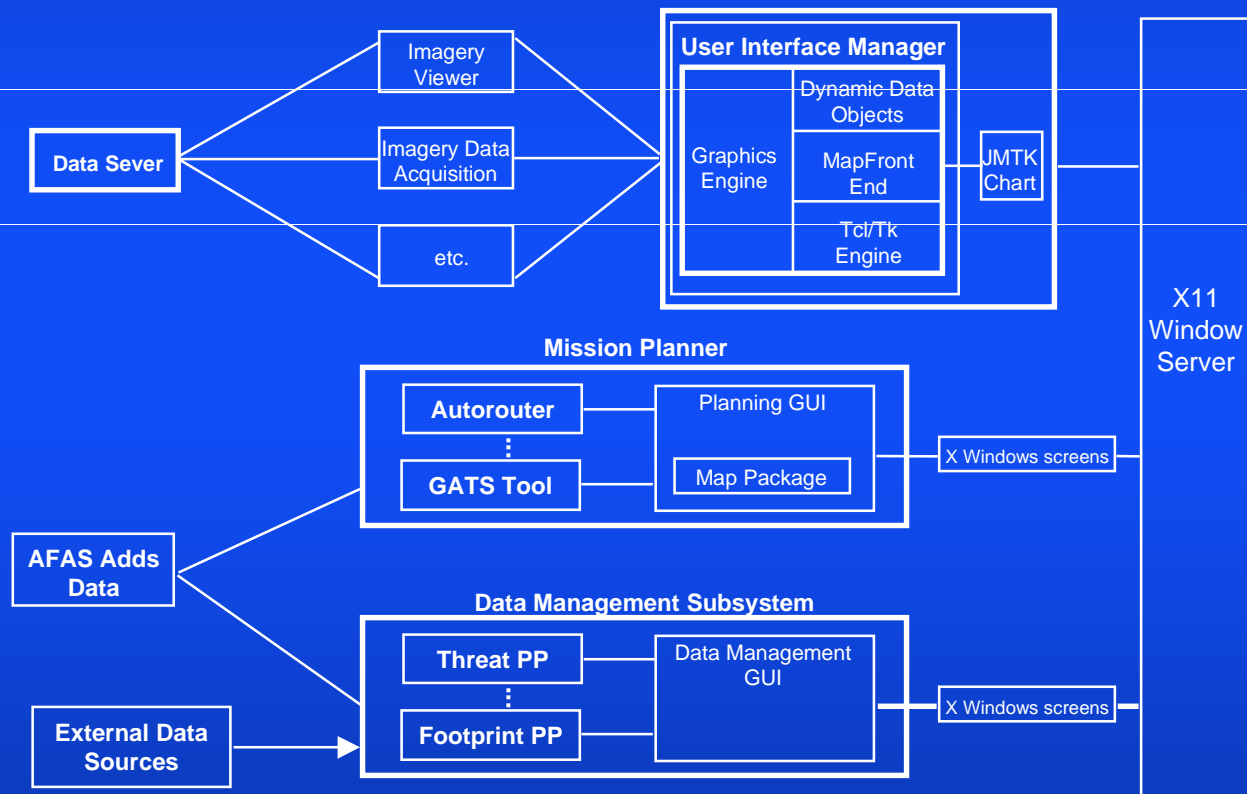


TCS Data Server & JMTK Chart Integration



TCS Data Server & JMTK Chart Integration

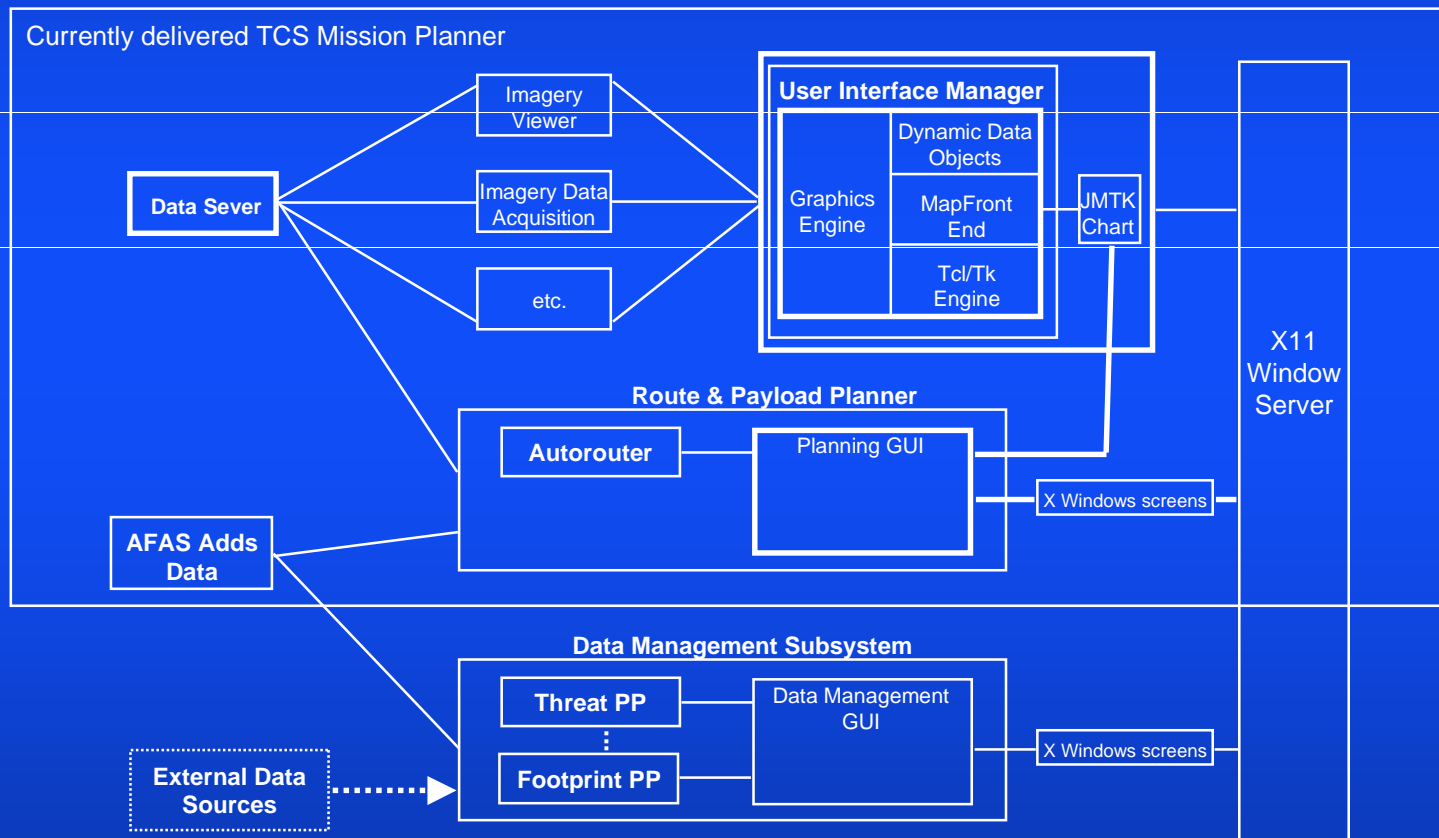
- **Starting Point: Same Platform But Not Integrated**





TCS Data Server & JMTK Chart Integration (con't)

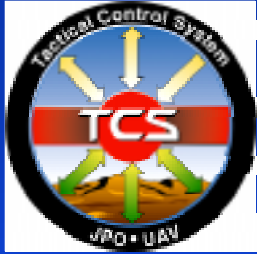
- Integrated for Data Exchange, Integrated to JMTK Chart





TCS Data Server & JMTK Chart Integration (con't)

- Upload completed missions to the TCS Data Server
- Download current AV status from TCS Data Server for inflight replanning
- All map based displays use JMTK Chart

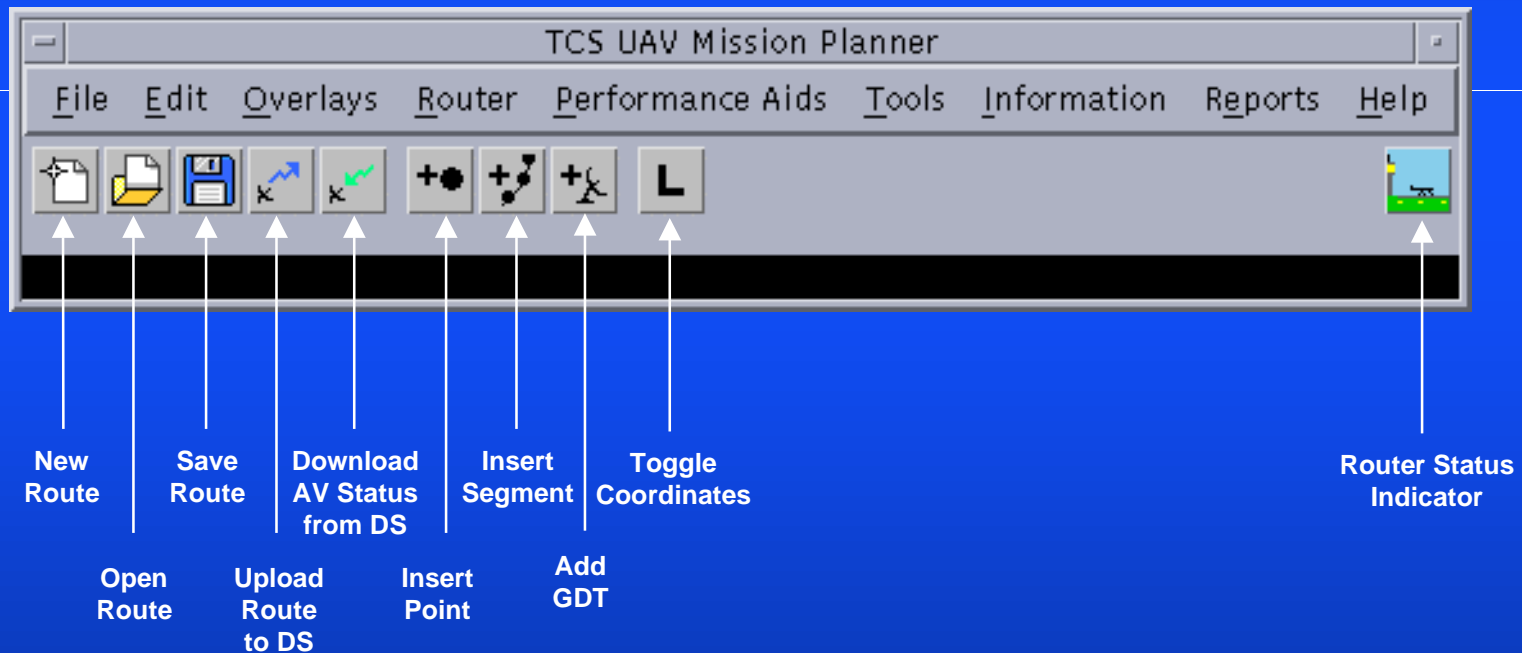


Software Functionality



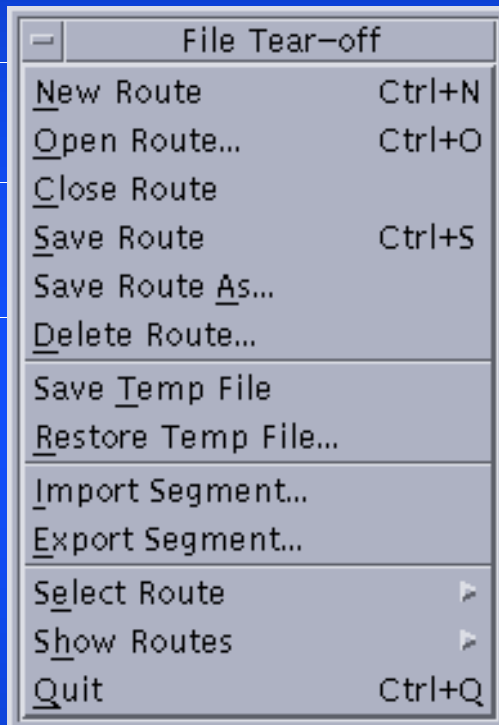
Software Functionality

Menu and Tool Bar





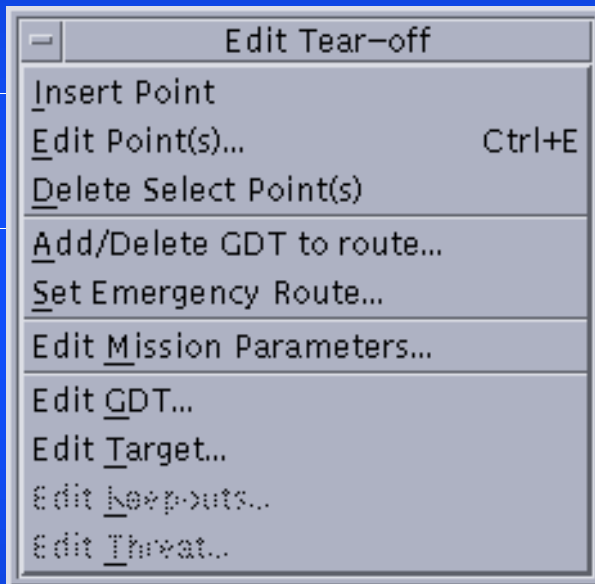
Software Functionality (con't)



- File Pulldown Menu
- Open, Save, Save As and Delete Route work against the configured storage directory
- Save Temp File and Restore Temp File can be used like undo. The user is allowed to save up to 10 versions of any one file.
- Select Route is a pullright menu that allows the user to select which of the loaded routes is the active route for editing (there is a menu button for each route).
- Show Routes is a pullright menu that allows the user to declutter the screen by not displaying some routes.
- Import and Save Segment allows the user to create and access pre-planned segments.



Software Functionality (con't)

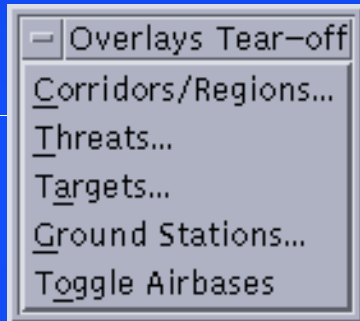


- **Edit Pulldown Menu**
- **Edit Point(s)** displays the “tabbed” dialog that allows the user to edit waypoint data, image data, weather data and communication plan data.
- **Delete** will delete the selected point/segment.
- **Add and Delete GDT** is how the user selects which GDT(s) to use.
- **Edit Mission Parameters** allows the setting of default data for the route, as well route specific data like aircraft type and amount of fuel.
- **Edit GDT/Target** edits the selected database.



Software Functionality (con't)

- Overlays Pulldown Menu
- Allows for the graphical display of

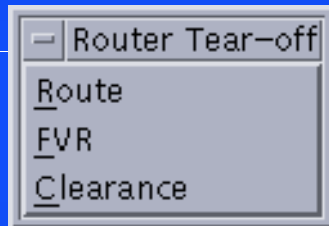


- Corridors
 - AWACs corridors
 - Keepout Zones
 - Threats
 - Targets
 - GDTs
 - Airbases
- The dialogs allow some filtering and other options for these items.



Software Functionality (con't)

Router Pulldown Menu



- **Route** allows the user to run the low observable autorouter or flight sim.
- **FVR (Finalize Vertical Route)** smoothes the route for times, fuel and vertical profile.
- **Clearance** checks for terrain clearance.



Software Functionality (con't)

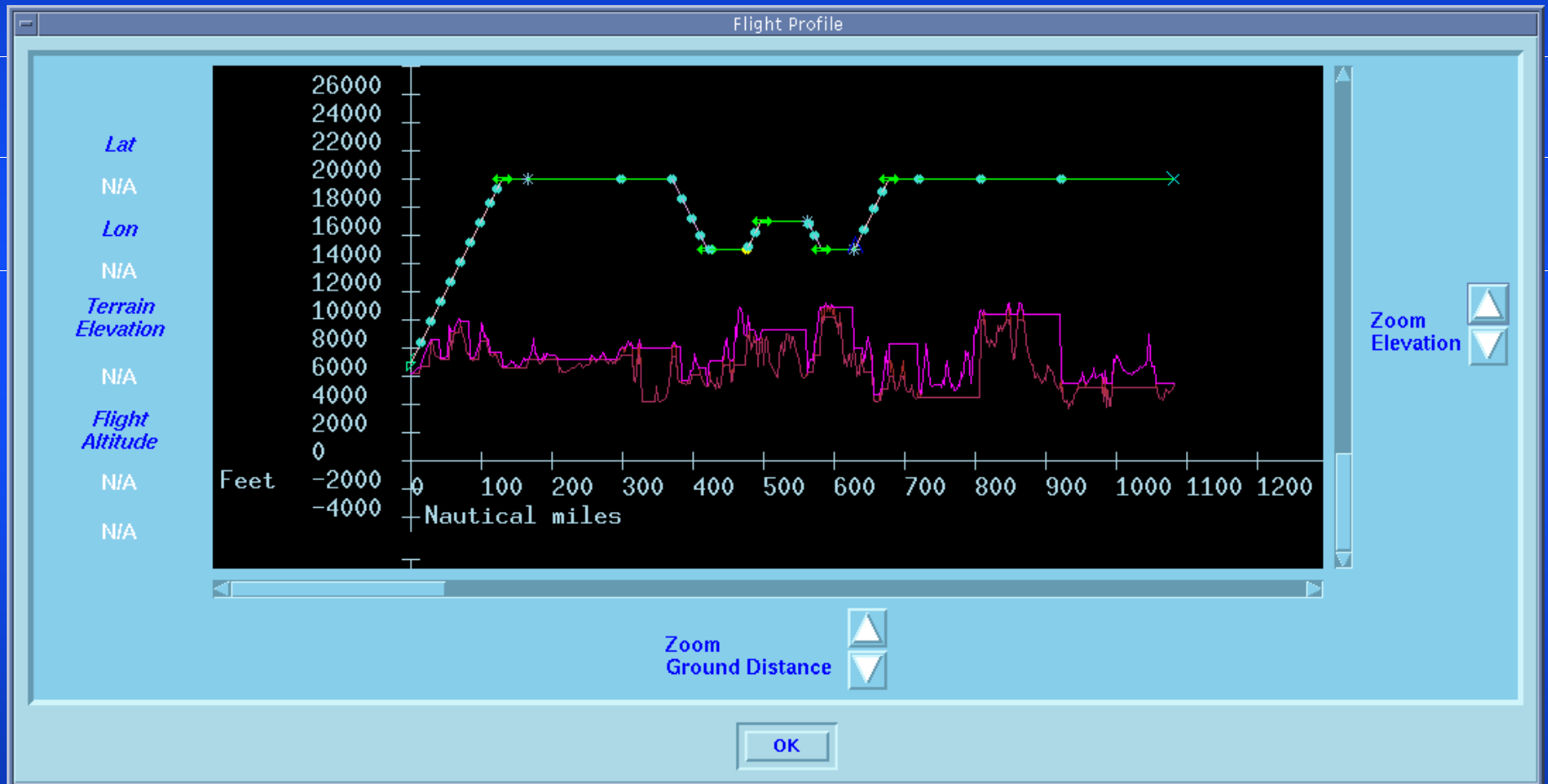


Performance Aids Pulldown Menu

- **Flight Profile** shows the min and max terrain for the corridor, the terrain under the route and the profile of the route.
- **Terrain Profile** shows the terrain between two user-selected points.
- **Recovery basket** will display the maximum flight distance from a given point



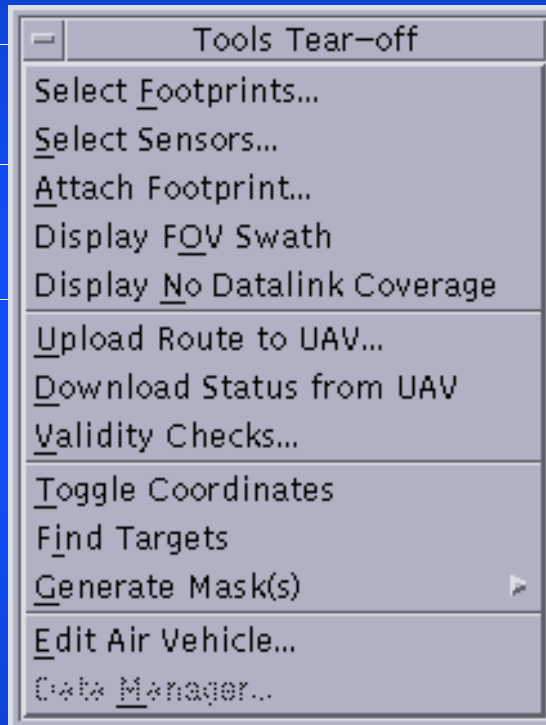
Software Functionality (con't)





Software Functionality (con't)

Tools Pulldown Menu



- **Select Footprints** allows the selection of footprint data.
- **Select Sensors** allows the selection of sensor data.
- **Attach Footprint** allows the “animation” of footprints/ sensors along the route.
- **Display FOV Swath** will generate a static display showing the field of view(s) for the route.
- **Display No Datalink Coverage** highlights areas that are out of communications coverage.
- **Toggle Coordinates** switches between Lat/Lon, UTM's and MGRs.
- **Edit Air Vehicle** is how the user sets up new air vehicles.



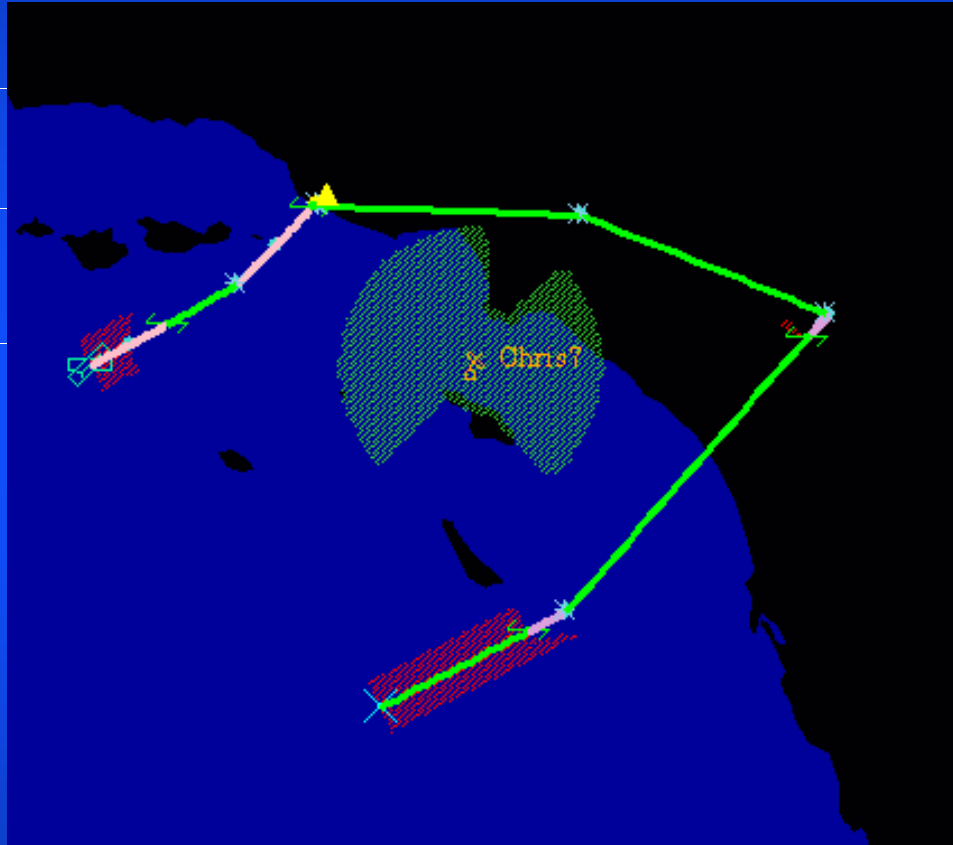
Software Functionality (con't)



- GDT Terrain mask with No Datalink Coverage Displayed
 - GDT mask at 12,000 feet



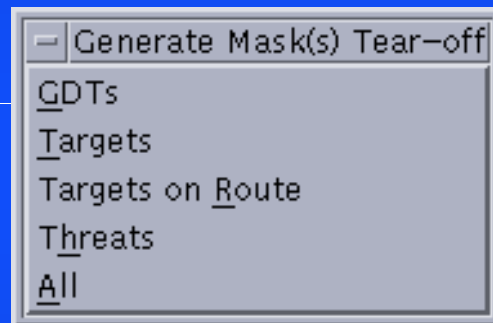
Software Functionality (con't)



- GDT Terrain mask with No Datalink Coverage Displayed
 - GDT mask at 500 feet



Software Functionality (con't)



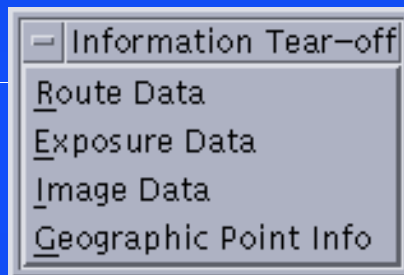
- **Generate Mask(s) Pullright Menu**
- **Generates the terrain visibility masks for the selected databases.**



Software Functionality (con't)

Information Pulldown Menu

- These items display different types of textual displays.



- Route is data about each route point
- Exposure is data about the exposure to threats on a segment by segment basis
- Image is data about the image points
- Geographic is data about a point on the earth and what is near it



Software Functionality (con't)

Reports Pulldown Menu



- **The Sortie Report displays the flight plan.**
- **The Session Report displays errors that have occurred during the last tool run (file access errors, ...).**
- **The Error Report displays the route specific errors.**
- **The Evaluation displays the evaluator report regarding the quality of route.**



Software Functionality (con't)

Edit Dialog

Waypoint | Image pt. | Weather | Comm. Plan | Look Envelope

Route Point: 5

Lat. (hdd:mm:ss) : :

Lon. (hddd:mm:ss) : :

Alt. (ft. MSL)/Head (deg)

Air Speed (knots)

Wind: Speed (knots)/Dir. (deg)

Auto Pilot Altitude Mode:

Auto Pilot Airspeed Mode:

Comment (optional)

Loiter

Pattern

Time (hh:mm)/head (deg)

Pattern Length/width (nm)

VCR Control:

UAV VCR Source Review:

On Loss of Link:

Return to Base Action:

☒ Lat/Lon ☐ MGRS ☐ UTM



Software Functionality (con't)

- **Edit Dialog**
- The Edit dialog has its own coordinate sets. This allows the user to change the settings on this dialog easily and quickly.
- The dialog will update interactively based on what options are selected by the user. For example, the loiter option menu will control what fields are displayed for entering data.



Software Functionality (con't)

Edit Dialog

Waypoint | Image pt. | Weather | Comm. Plan | Look Envelope

Sensor Used: IR

EO/IR

Pointing Mode: Point

Target Id:

MGRS 115 LS 82106 85939

zzg en eeeee nnnnn

Elevation (ft.) 0

Priority: High

Comment (optional)

IR

FOV 2X: None

FOV: 19mm

Image Polarity: White Hot

☐ Lat/Lon ☒ MGRS ☐ UTM

Prev. Point Next Point

Apply Ok Cancel Help

- The dialog changes based on the type of sensor selected.
- Pointing Mode determines if coordinates or azimuth and depression angle fields are displayed.



Software Functionality (con't)

Edit Dialog

Waypoint Image pt. Weather Comm. Plan Look Envelope

Altitude (MSL feet)	Visibility (nm)	Humidity (%)	Temperature (deg. F)	Barm. Press. (millibars)
32808	100	29	-58	265
22966	50	28	-23	411
16404	20	54	1	540
6562	10	52	36	795
0 AGL	3	46	59	1013

Prev. Point Next Point

Apply Ok Cancel Help

- Weather only stored at image points
- 5 altitude bands available
- Eventually this data will come from the weather feed and the user will be able to override the values



Software Functionality (con't)

Edit Dialog

Waypoint | Image pt. | Weather | Comm. Plan | Look Envelope

Datalink:

Comm. Satellite Lon. (hddd:mm:ss): : :

Satcom Channel Number (0-100):

Comm. Freq. (240-16000 Khz):

IFF Settings

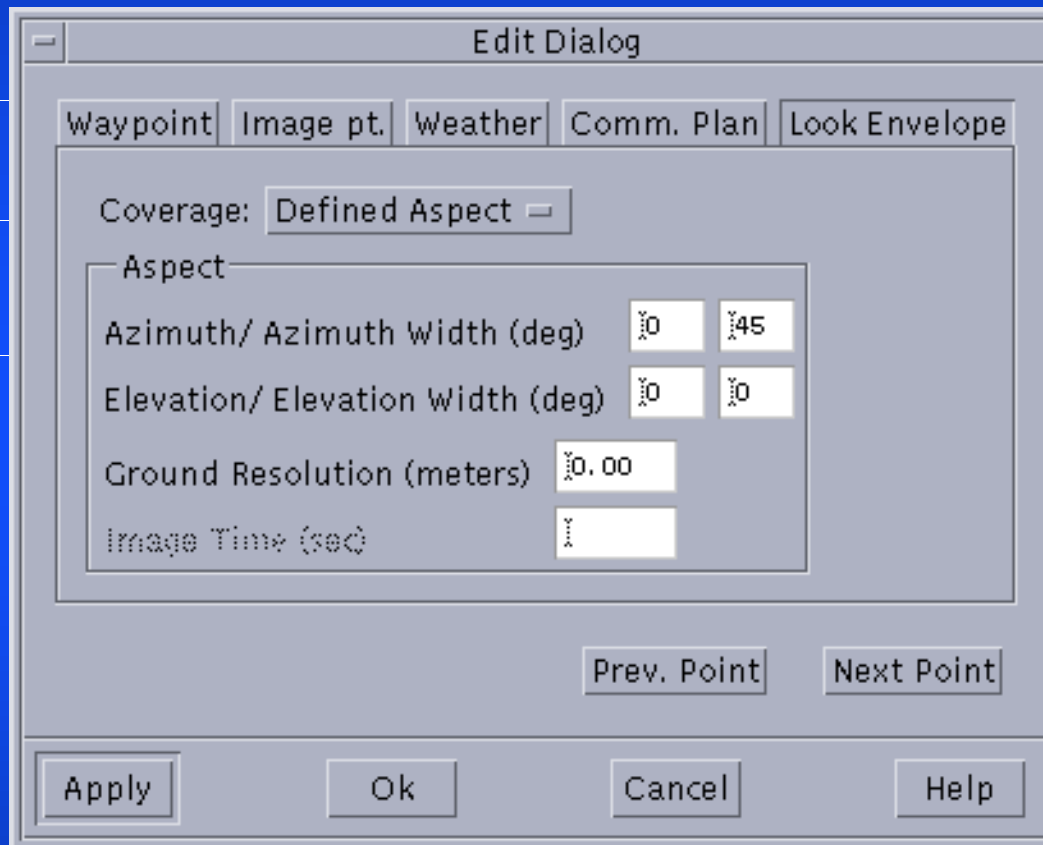
On/Off

Squawk Code (0-7777 octal):

- Enter data regarding the communication plan



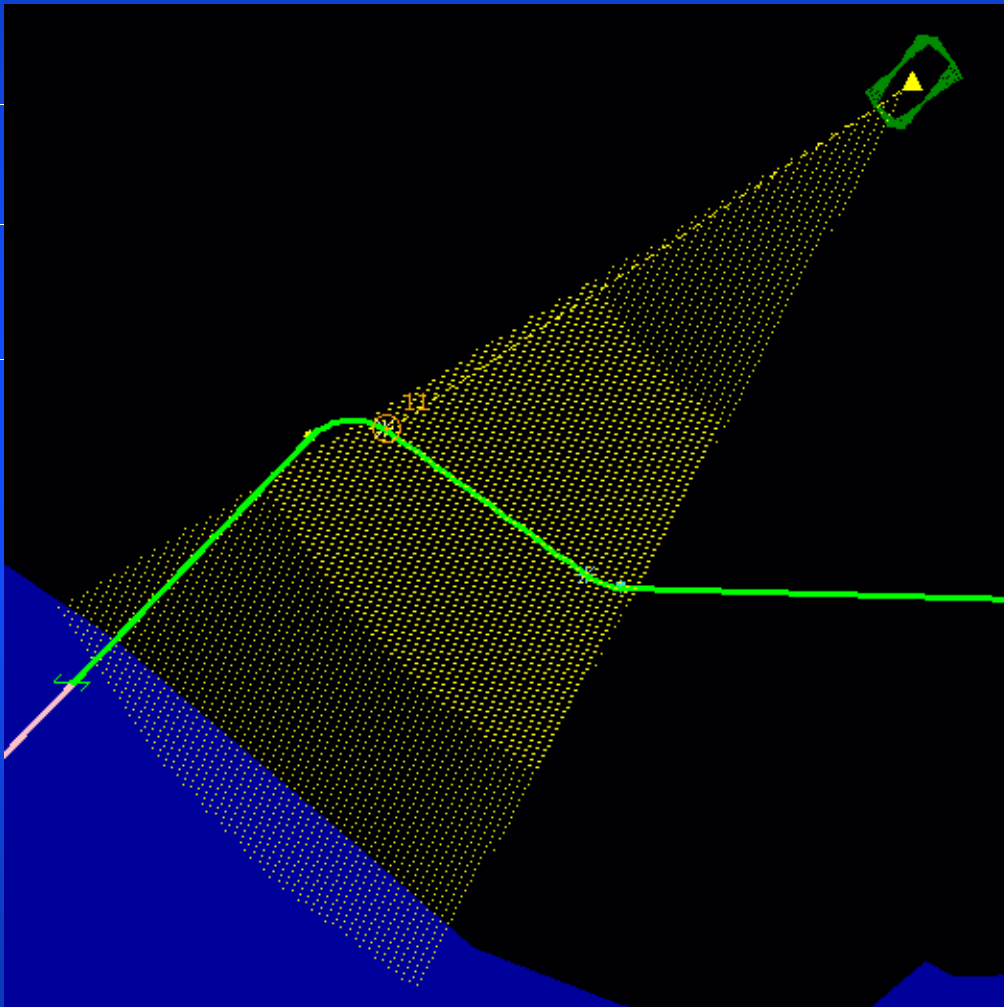
Software Functionality (con't)



- **Look Envelopes aid the operator in locating collection points**



Software Functionality (con't)



- Sample look envelope
 - IR
 - AV at 12000 feet
 - Target at 16 feet
 - 225 Azimuth
 - 30 Azimuth Width
 - 45 Elevation
 - 20 Elevation Width
 - 10 meter ground resolution



Software Functionality (con't)

Edit Mission Parameters

Mission ID:

AV Type: AV ID:

☐ Emergency Route

☐ Predator Payload

☒ Skyball

☒ SAR

Launch Time:
YYYY MM DD hh mm

Takeoff Fuel (lbs.):

Reserve Fuel (lbs.):

Airspeed Max. (knts.):

Airspeed Min. (knts.):

Airspeed (knts.):

Rte. Corr. Width (nm):

Terrain Clear. (ft.):

- User can enter default data for the route
- Default data for the route can be updated at any time
- The payloads available change depending on the type of aircraft selected.



Software Functionality (con't)

Aircraft Characteristics Editor (Predator: predator)

General Define Levels Rate Tables Fuel Tables

Weights (lbs)

Empty: 1200 Fuel Cap. (glns.): 108

Max: 2300 Fuel Wght/Gln.: 6.02

Stores: 450 Max. Fuel: 650

Bingo Fuel: 75

Altitudes (ft.)

Max.: 25000

Default: 15000

Trnn. Clear.: 90

Air Speeds (knots)

Min.: 54.0

Max.: 120.0

Default: 65.0

Datalink Range: 350.00

Rte. Corr. Wid.: 5.90

Angles (degrees)

Max Bank: 25.00

Default Bank: 15.00

Comment

Initial installation setup for PREDATOR configuration. Values subject to change as further refinement is necessary.

Apply Ok Cancel Help

Payloads

Defined Available

EO1 EO2 IR

IR EO1

SAR EO2

<<< Add Remove

SAR

Datalinks

Defined Available

LOS LOS

Ku-Band Ku-Band

UHF UHF

<<< Add Remove

- Allows user to enter and edit AV performance data